**Model Optimization and Tuning Phase**

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| Date | 23 March 2024 |
| Team ID | 738220 |
| Project Title | Walmart Sales Analysis for Retail Industry  with Machine Learning |
| Maximum Marks | 10 Marks |

**Model Optimization and Tuning Phase**

The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

### Hyperparameter Tuning Documentation:

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| --- | --- | --- |
| **Model** | **Tuned Hyperparameters** | **Optimal Values** |
| Random Forest |  |  |
| Decision Tree |  |  |
| ARIMA |  |  |
| XGBoost |  |  |

### Performance Metrics Comparison Report :

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| --- | --- |
| **Model** | **Optimized Metric** |
| Decision Tree |  |
| Random Forest |  |
| ARIMA |  |
| XGBoost |  |

### Final Model Selection Justification (2 Marks):

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| --- | --- |
| **Final Model** | **Reasoning** |
| Random Forest | Both decision tree and random forest models achieved high accuracy, with decision tree reaching 100% accuracy and random forest achieving 99.05% accuracy. However, decision tree models often result in overfitting and high loss due to their complexity, whereas random forest models balance accuracy with reduced loss across different models. This suggests that random forest is the most effective model, as it maintains high accuracy while retaining the most useful information. |